Contents

Preface vii

Section I. Spent Nuclear Fuel

Spent fuel corrosion and dissolution, *R.S. Forsyth and L.O. Werme* 3
The prediction of nuclear fuel (UO_2) dissolution rates under waste disposal conditions, *D.W. Shoesmith and S. Sunder* 20
Reactivity effects in the oxidative dissolution of UO_2 nuclear fuel, *W.H. Hocking, D.W. Shoesmith and J.S. Betteridge* 36
Parametric study of LWR spent fuel dissolution kinetics, *W.J. Gray, H.R. Leider and S.A. Steward* 46
Oxidation of spent fuel in air at 175 to 195°C, *R.E. Einziger, L.E. Thomas, H.C. Buchanan and R.B. Stout* 53
Static and dynamic SIMFUEL dissolution studies under oxic conditions, *J. Bruno, I. Casas and A. Sandino* 61
SIMFUEL dissolution studies in granitic groundwater, *K. Ollila* 70
Oxidation of UO_2 fuel by the products of gamma radiolysis of water, *S. Sunder, D.W. Shoesmith, H. Christensen and N.H. Miller* 78
Trends in the short-term release of fission products and actinides to aqueous solution from used CANDU fuels at elevated temperature, *S. Stroes-Gascoyne* 87
Radiation damage-enhanced dissolution of UO_2 in water, *Hj. Matzke* 101
Uranium release and secondary phase formation during unsaturated testing of UO_2 at 90°C, *D.J. Wronkiewicz, J.K. Bates, T.J. Gerding, E. Veleckis and B.S. Tani* 107
Structural formula of uraninite, *J. Janeczek and R.C. Ewing* 128
The corrosion of uraninite under oxidizing conditions, *R.J. Finch and R.C. Ewing* 133
Dissolution and alteration of uraninite under reducing conditions, *J. Janeczek and R.C. Ewing* 157
Alteration of uranium minerals in the Koongarra deposit, Australia: Unweathered zone, *H. Isobe, T. Murakami and R.C. Ewing* 174

Section II. Nuclear Waste Glasses

A mechanistic model for understanding nuclear waste glass dissolution, *F. Delage, D. Ghaleb, J.L. Dussossoy, O. Chevallier and E. Vernaz* 191
Issues affecting the prediction of glass reactivity in an unsaturated environment, *J.K. Bates, W.L. Ebert, X. Feng and W.L. Bourcier* 198
The compared aqueous corrosion of four simple borosilicate glasses: Influence of Al, Ca and Fe on the formation and nature of secondary phases, *L. Trotignon, J.-C. Petit, G. Della Mea and J.-C. Dran* . 228
The development of surface alteration layers on SRL-165 nuclear waste glasses, *V.M. Oversby and D.L. Phinney* 247
The role of Al_2O_3 in the long-term corrosion stability of nuclear waste glasses, *P. Van Iseghem, T. Amaya, Y. Suzuki and H. Yamamoto* 269
Water diffusion in tektites: An example of the use of natural analogues in evaluating the long-term reaction of glass with water, *J.J. Mazer, J.K. Bates, C.R. Bradley and C.M. Stevenson* 277

Section III. Synroc

The durability of Synroc, *K.L. Smith, G.R. Lumpkin, M.G. Blackford, R.A. Day and K.P. Hart* 287
High-temperature study of $CaZrTi_2O_7$, *E.R. Vance, D.J. Cassidy, C.J. Ball and G.J. Thorogood* 295
Thermal expansion coefficients of zirconolite ($CaZrTi_2O_7$) and perovskite ($CaTiO_3$) from X-ray powder diffraction analysis, *C.J. Ball, G.J. Thorogood and E.R. Vance* 298
Analytical electron microscopy of columbite: A niobium–tantalum oxide mineral with zonal uranium distribution, *G.R. Lumpkin* 302

Section IV. Cement

A thermodynamic model for blended cements. II: Cement hydrate phases; thermodynamic values and modelling studies, *D.G. Bennett, D. Read, M. Atkins and F.P. Glasser* 315

Section V. Canister Materials

Modified log-activity diagrams as a tool for modelling corrosion of nuclear waste container materials, with particular reference to copper, *D.W. Mohr and M.B. McNeil* 329

Author index 343

Subject index 345